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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/020,977	12/19/2001	Yukihiro Shibata	520.40997X00	1174

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EXAMINER
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STOCK JR, GORDON J

ART UNIT	PAPER NUMBER
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2877

DATE MAILED: 04/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/020,977	Applicant(s) SHIBATA ET AL	
	Examiner Gordon J. Stock	Art Unit 2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 07 February 2005.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-7, 11, 12 and 21-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7, 11, 12 and 21-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 December 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claim 6** is rejected under 35 U.S.C. 102(b) as being anticipated by **Maeda et al.** (5,774,222)—previously cited.

As for **claim 6**, Maeda in a method and apparatus for inspecting defects of patterns discloses the following: illuminating a sample through an objective lens (Fig. 1: 3, 9); obtaining a plurality of images having different transmissions of zeroth order diffraction light through said objective lens by changing attenuation of zeroth order diffracted light; determining conditions and optimizing conditions of the transmission to increase sensitivity (col. 22, lines 25-65; col. 23, lines 15-40); obtaining the image signal of said sample under adjusted conditions by imaging said sample through objective lens (col. 22, lines 15-55; col. 23, lines 15-40); detecting a defect of said sample by processing the image signal (col. 7, lines 1-30; col. 8, lines 7-25); whereas, brightfield illumination, annular looped illumination, is used (col. 31, line 42; Fig. 1); wherein said step of obtaining a plurality of images by changing the transmission ratio of said zeroth order diffracted light is performed for a plurality of regions of said sample (col. 9, lines 45-60); a particular value of the transmission ratio of the zeroth order diffracted light with a which a brightness-difference of the detected images among the plurality of regions of the said sample is

decreased is set as conditions for the transmission ratio that increase said defect detection sensitivity, a threshold value (col. 23, lines 25-40).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 1-2, 4, 5, 21-26** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Maeda et al. (5,774,222)** )—previously cited in view of **Worster et al. (5,479,252)** )—previously cited

As for **claims 1, 2, 4, 5, 21, 23**, Maeda in a method and apparatus for inspecting defects of patterns discloses the following: obtaining an image signal of a sample by imaging said sample through an objective lens of a bright field optical system (Fig. 1: 3, 9, 12a); adjusting optical conditions of said bright field optical system so as to decrease a difference of contrast, balancing first order and zeroth order intensities, among pattern signals; whereas, adjustment of the transmission ratio of diffracted light via a spatial filter, an attenuation filter and mask system (col. 14, lines 45-65: Fig. 1: 14a, 14, 38)); obtaining the image signal of said sample under adjusted conditions by imaging said sample through objective lens (col. 22, lines 15-55; col. 23, lines 15-40); detecting a defect of said sample by processing the image signal (col. 7, lines 1-30; col. 8, lines 7-25); whereas, the transmission percentage of diffracted light is done via a spatial filter, attenuation filter, that is positioned near the Fourier transform plane and via a mask for controlling illumination (col. 9, lines 28-45: Fig. 1: 14a, 14, 38)); illuminating a sample through

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an objective lens (Fig. 1: 3, 9); obtaining a plurality of images having different transmissions of zeroth order diffraction light through said objective lens by changing attenuation of zeroth order diffracted light; determining conditions and optimizing conditions of the transmission to increase sensitivity (col. 22, lines 25-65; col. 23, lines 15-40); obtaining the image signal of said sample under adjusted conditions by imaging said sample through objective lens (col. 22, lines 15-55; col. 23, lines 15-40); detecting a defect candidate of said sample by processing the image signal (col. 7, lines 1-30; col. 8, lines 7-25); whereas, brightfield illumination, annular looped illumination, is used (col. 31, line 42; Fig. 1); storing defect candidates (col. 2, lines 45-55). As for repeatedly obtaining image signals of a same portion, Maeda does not explicitly state this but suggests it from having at least two images being obtaining through repeated inspection and through feed scanning (col. 9, lines 55-67). However, Worster in an inspection teaches repeatedly obtaining images while scanning (col. 7, lines 30-35). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have the inspection device repeatedly obtain images in order to have a complete portion of a wafer inspected such as one line of the wafer in the x-direction.

As for **claims 22 and 24**, Maeda in view of Worster disclose everything as above (see claims 21 and 23). In addition, an optical condition is a polarization state of a light which illuminates said sample in the step of obtaining (col. 10, lines 10-15; Figs. 37-38).

As for **claims 25**, Maeda in an apparatus for inspecting defects discloses: an optical control unit, an adjustment unit, which controls a transmission ratio of light illuminated by said illuminating system and reflected (Fig. 1: 14, 14a, and 38); an imaging optical system, image detecting unit, and defect detecting section (Fig. 1: 8a, 8b, 13, 12a, 15a, 17, 20); contrast

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calculating unit (Fig. 38). As for repeatedly obtaining image signals of a same portion, Maeda does not explicitly state this but suggests it from having at least two images being obtaining through repeated inspection and through feed scanning (col. 9, lines 55-67). However, Worster in an inspection teaches repeatedly obtaining images while scanning (col. 7, lines 30-35).

Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have the inspection device repeatedly obtain images in order to have a complete portion of a wafer inspected such as one line of the wafer in the x-direction.

As for **claim 26**, Maeda in view of Worster disclose everything as above (see **claim 25**). In addition, an optical condition is a polarization state of a light which illuminates said sample in the step of obtaining (col. 10, lines 10-15; Figs. 37-38).

5. **Claims 3, 11-12** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Maeda et al. (5,774,222)** —previously cited.

As for **claim 3**, Maeda in a method and apparatus for inspecting defects of patterns discloses the following: illuminating a sample through an objective lens (Fig. 1: 3, 9); obtaining a plurality of images having different transmissions of zeroth order diffraction light through said objective lens by changing attenuation of zeroth order diffracted light; determining conditions and optimizing conditions of the transmission to increase sensitivity (col. 22, lines 25-65; col. 23, lines 15-40); obtaining the image signal of said sample under adjusted conditions by imaging said sample through objective lens (col. 22, lines 15-55; col. 23, lines 15-40); detecting a defect of said sample by processing the image signal (col. 7, lines 1-30; col. 8, lines 7-25); whereas, brightfield illumination, annular looped illumination, is used (col. 31, line 42; Fig. 1); wherein

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said step of obtaining a plurality of images by changing the transmission ratio of said zeroth order diffracted light is performed for a plurality of regions of said sample (col. 9, lines 45-60).

As for said step of adjusting the transmission ratio of said zeroth order diffracted light by utilizing a polarization difference between zeroth order diffracted light and higher order diffracted light, Maeda does not explicitly state this. Examiner takes official notice that it is well-known that diffracted light orders are at different angles of reflection. In addition, Maeda teaches an optical condition is a polarization state of a light which illuminates said sample in the by demonstrating polarity differences in brightfield and darkfield imaging and intensities changes and polarization differences at differing angles (col. 10, lines 10-15; Figs. 37-38). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have an optical adjustment condition utilize polarization difference between the zeroth order diffracted light and higher order diffracted light for defect detection for difference is contrast is related to polarity differences as well as angle differences such as between darkfield and brightfield imaging.

As for **claims 11, 12**, Maeda in an apparatus for inspecting defects discloses: a stage (Fig. 1: 2); an illuminating system with an objective lens (Fig. 1: 3, 9); an optical control unit which controls a transmission ratio of light, zeroth order diffracted, illuminated by said illuminating system and reflected so as to decrease a difference in contrast in an image signal among segments corresponding to a plurality of regions on said sample (Fig. 1: 14, 14a, and 38); an imaging optical system, image detecting unit, and defect detecting section (Fig. 1: 8a, 8b, 13, 12a, 15a, 17, 20); contrast calculating unit (Fig. 38); whereas, brightfield illumination, annular looped illumination, is used (col. 31, line 42; Fig. 1).

As for said optical control unit adjusting the transmission ratio of said zeroth order diffracted light by utilizing a polarization difference between zeroth order diffracted light and higher order diffracted light, Maeda does not explicitly state this. Examiner takes official notice that it is well-known that diffracted light orders are at different angles of reflection. In addition, Maeda teaches an optical condition is a polarization state of a light which illuminates said sample in the by demonstrating polarity differences in brightfield and darkfield imaging and intensities changes and polarization differences at differing angles (col. 10, lines 10-15; Figs. 37-38). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have an optical adjustment condition utilize polarization difference between the zeroth order diffracted light and higher order diffracted light for defect detection for difference in contrast is related to polarity differences as well as angle differences such as between darkfield and brightfield imaging.

6. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Maeda et al. (5,774,222)** )—previously cited in view of **Fujita (6,535,621)**.

As for **claim 7**, Maeda in a method and apparatus for inspecting defects of patterns discloses the following: illuminating a sample through an objective lens (Fig. 1: 3, 9); obtaining a plurality of images having different transmissions of zeroth order diffraction light through said objective lens by changing attenuation of zeroth order diffracted light; determining conditions and optimizing conditions of the transmission to increase sensitivity (col. 22, lines 25-65; col. 23, lines 15-40); obtaining the image signal of said sample under adjusted conditions by imaging said sample through objective lens (col. 22, lines 15-55; col. 23, lines 15-40); detecting a defect of said sample by processing the image signal (col. 7, lines 1-30; col. 8, lines 7-25); whereas,



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brightfield illumination, annular looped illumination, is used (col. 31, line 42; Fig. 1); wherein said step of obtaining a plurality of images by changing the transmission ratio of said zeroth order diffracted light is performed for a plurality of regions of said sample (col. 9, lines 45-60).

As for the images detected for the plurality of regions of said sample are subjected to second differentiation to sum up secondary differential values in the images, and a particular value of the transmission ratio of the zeroth order diffracted light with which the summation of the secondary differential values is increased is set as conditions for the transmission ratio to increase said defect detection sensitivity, he is silent. However, Fugita in a defect processing apparatus teaches a secondary differentiation and secondary threshold to detect a second group of defect types (second macro-filter processing portion of Fig. 4). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have the system comprise a secondary differentiation and secondary threshold value in order to detect and discriminate between different types of defects on a wafer.

#### *Response to Arguments*

7. Applicant's arguments with respect to the claims as cited in Remarks February 7, 2005 have been considered but are moot in view of the new ground(s) of rejection. As for the allowable subject matter mentioned in the previous action, the Examiner apologizes for the inconvenience but upon further search and further consideration of Maeda et al. (5,774,222) and Worster et al. (5,479,252) new rejections were made.

#### *Fax/Telephone Numbers*

If the applicant wishes to send a fax dealing with either a proposed amendment or a discussion with a phone interview, then the fax should:

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1) Contain either a statement "DRAFT" or "PROPOSED AMENDMENT" on the fax cover sheet; and

2) Should be unsigned by the attorney or agent.

This will ensure that it will not be entered into the case and will be forwarded to the examiner as quickly as possible.

*Papers related to the application may be submitted to Group 2800 by Fax transmission. Papers should be faxed to Group 2800 via the PTO Fax machine located in Crystal Plaza 4. The form of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The CP4 Fax Machine number is: (703) 872-9306*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gordon J. Stock whose telephone number is (571) 272-2431.


The examiner can normally be reached on Monday-Friday, 10:00 a.m. - 6:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached at 571-272-2800 ext 77.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private Pair system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

gs

April 17, 2005



Layla Lauchman  
Primary Examiner  
Art Unit 2877